

CLAIMS

1. A color reproduction system comprising:
color image input means for sensing an object;
color estimation means for calculating tristimulus
5 values from a color image signal obtained by said color
image input means; and

color image output means for outputting a color
image signal based on a color represented by the
tristimulus values obtained by said color estimation
10 means,

said color estimation means including:

illumination light measuring means for measuring
tristimulus values of observation illumination light,

virtual illumination light spectrum calculation
15 means for calculating a virtual illumination light
spectrum that provides tristimulus values equal to the
tristimulus values of the observation illumination
light which are obtained by said illumination light
measuring means, and

20 tristimulus value calculation means for
calculating tristimulus values of the object under the
virtual illumination light spectrum from the color
image signal.

2. A system according to claim 1, wherein
25 said virtual illumination light spectrum calculation
means calculates a spectrum from a linear ^{combination} ~~sum~~ of
predetermined illumination light spectrum ^{basis} ~~basic~~

functions.

Sub 66 → 3. A system according to claim 1, wherein said virtual illumination light spectrum calculation means calculates a spectrum corresponding to linear conversion between a product of a spectral sensitivity of said color image input means and a photographing illumination light spectrum and a product of a color matching function and the virtual illumination light spectrum.

10 4. A system according to claim 1, wherein said color image input means and said illumination light measuring means are positioned under different kinds of illumination light.

15 5. A color reproduction system comprising:
color image input means for sensing an object;
color estimation means for calculating tristimulus values from a color image signal obtained by said color image input means; and

20 color image output means for outputting a color based on the tristimulus values obtained by said color estimation means,

a said color estimation means including:

illumination light measuring means for measuring tristimulus values of observation illumination light;

25 tristimulus value calculating means for calculating tristimulus values of the object under a predetermined standard illumination light spectrum

from the color image signal, and

corresponding color calculation means for
calculating tristimulus values that provide
"appearance" of the color of the object which is
5 based on the tristimulus values under the standard
illumination light spectrum.

6. A color reproduction system which can sense
a predetermined object as a color image, perform color
correction of the sensed color image, and perform data
10 transfer through a line, comprising:

a color camera for sensing the object under
photographing illumination light;

a simplified ^{*spectrophotometer*} ~~spectrometer~~ for measuring a spectrum
of the photographing illumination light;

15 an illumination light colorimeter for measuring
tristimulus values of observation illumination light
on an object observation side, and transferring the
tristimulus value data of the observation illumination
light to a color correction device through a line;

20 a color correction device for calculating
tristimulus values of the object under the virtual
illumination light spectrum generated on the basis of
the transferred tristimulus values of the observation
illumination light, and converting the tristimulus
25 values into a monitor signal by using monitor profile
data; and

a monitor for displaying a color image including

an object image color-corrected by said color correction device.

7. A system according to claim ⁶~~5~~, wherein said color correction device comprises:

5 a storage device storing a ^{basis}~~basic~~ function ρ of a daylight spectrum, monitor profile data MTP, color matching function data CMF, and spectral sensitivity data h of said RGB color camera in advance;

10 a virtual illumination light spectrum calculator for calculating virtual illumination light spectrum data OS from tristimulus values $IXYZ$ of observation illumination light measured by said illumination light colorimeter and the ^{basis}~~basic~~ function ρ from said storage device;

15 a spectral reflectance calculator for calculating spectral reflectance data f of the object from object characteristic data σ and the spectral sensitivity data h from said storage device, RGB image data CRGB input from said RGB color camera, and a photographing
20 illumination light spectrum from a simplified ^{spectrophotometer}~~spectrometer~~;

a tristimulus value calculator for calculating tristimulus value data $OXYZ$ of the object from the color matching function data CMF from said storage
25 device, the virtual illumination light spectrum data OS from said virtual illumination light spectrum calculator, and the spectral reflectance data f from

said spectral reflectance calculator; and

an output signal calculator for calculating the
RGB image data CRGB serving as the monitor signal from
the monitor profile data MTP from said storage device
5 and the tristimulus value data OXYZ from said
tristimulus value calculator.

8. A system according to claim 6, wherein said
color correction device comprises:

a storage device storing the monitor profile data
10 MTP, the color matching function data CMF, and the
spectral sensitivity data h of said RGB color camera in
advance;

a virtual illumination light spectrum calculator
for calculating a conversion matrix MTX from the
15 tristimulus values IXYZ of the observation illumination
light measured by said illumination light measuring
device, the monitor profile data MTP from said storage
device, and the color matching function data CMF;

a tristimulus value calculator for calculating the
20 tristimulus value data OXYZ of the object from the
conversion matrix MTX from said virtual illumination
light spectrum calculator and the RGB image data CRGB
input from said RGB color camera; and

an output signal calculator for calculating RGB
25 image data CRGB serving as the monitor signal from the
monitor profile data MTP from said storage device and
the tristimulus value data OXYZ from said tristimulus

value calculator.

a 9. A system according to claim ⁶~~8~~, wherein said color correction device comprises:

5 a storage device storing object characteristic data σ , monitor profile data MTP, color matching function data CMF, standard illumination light spectrum data SS, tristimulus values JXYZ of standard illumination light, and spectral sensitivity data h of said RGB color camera;

10 a spectral reflectance calculator for calculating spectral reflectance data f of the object from the object characteristic data σ and spectral sensitivity data h from said storage device, RGB image data CRGB input from said RGB color camera, and photographing
15 illumination light spectrum data MS from said simplified ^{spectrophotometer} ~~spectrometer~~;

a tristimulus value calculator for calculating tristimulus values SXYZ of the object under standard illumination light from the spectral reflectance data f from said spectral reflectance calculator and the color
20 matching function data CMF and standard illumination light spectrum data SS from said storage device;

a corresponding color calculator for calculating tristimulus values CXYZ of a corresponding color of
25 said object from the tristimulus values SXYZ from said tristimulus value calculator, tristimulus values JXYZ of standard illumination light from said storage device,

and tristimulus values IXYZ of observation illumination light from said illumination light colorimeter; and

an output signal calculator for calculating RGB image data CRGB serving as the monitor signal from the
5 tristimulus values CXYZ from said corresponding color calculator and the monitor profile data MTP from said storage device.

10 10. A system according to claim ~~5~~⁶, wherein said color camera and said monitor are positioned under different kinds of illumination light, and image propagation is performed by wire communication.

15 11. A system according to claim ~~5~~⁶, wherein said color camera and said monitor are positioned under different kinds of illumination light, and image propagation is performed by radio communication.

20 12. A system according to claim 6, wherein said system comprises a plurality of color chips, each having a known spectral reflectance, and a digital camera having a known spectral sensitivity in place of said illumination light colorimeter, and

25 said color chips are arranged near said monitor and reflected light of observation illumination light reflected by each color chip is photographed by said digital camera, thereby calculating tristimulus values of the observation illumination light from a photographing signal of each color chip which is obtained by photographing, spectral sensitivity data of

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